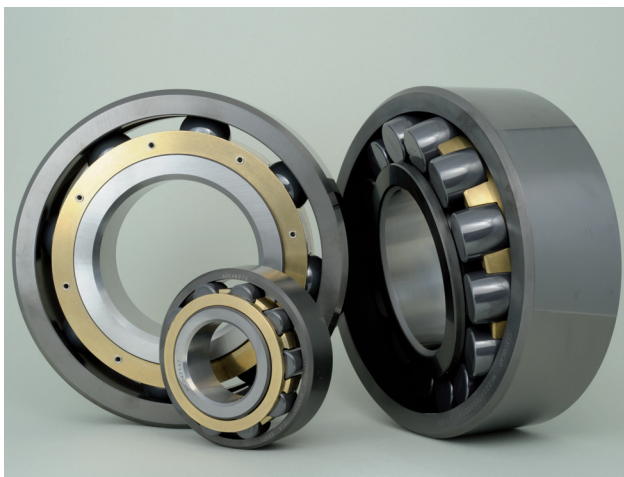


# PETROCHEMICAL INDUSTRY

## Rolling Bearing Solutions for LDPE & EVA High Pressure Autoclaves

The maintenance interval of high pressure autoclaves is very often defined by the service life of the motor and stirrer bearings. Although these bearings seem to be well dimensioned with regard to the relatively low weight of the motor or the stirrer they carry, the bearings normally fail after some weeks or latest some months, only. These early bearing failures are related to the poor lubrication conditions under which the bearings have to operate. Due to the high product flow through the reactor, conventional lubrication by oil and grease is not possible, because the lubricant is simply washed away by the product. The only "lubricant" which remains for the bearings, is the product itself. But the low viscosity of the media, gaseous ethylene and VA at the motor and upper stirrer bearings and a mix of gaseous and liquefied LDPE or EVA in the lower stirrer position, does not allow to build a separating film between the rolling elements and the races. As a consequence adhesive wear on the steel rolling partners leads to rapid surface degradation and subsequent bearing failure, often caused by a catastrophic cage collapse.



*CEROBEAR Hybrid Ball & Roller Bearings for High Pressure Autoclaves*

CEROBEAR's hybrid ceramic ball and roller bearings for high pressure autoclaves directly address the main source of the failure, the adhesive wear. Silicon nitride ( $\text{Si}_3\text{N}_4$ ), the ceramic material which in hybrid bearings is used for the rolling elements, is formed by covalent bondings and does not comprise free electrons.

As a consequence,  $\text{Si}_3\text{N}_4$  is inert, it does not react with other materials and there is no material transition, no adhesive wear, between the rolling partners. At the same time  $\text{Si}_3\text{N}_4$  provides more than twice the hardness than bearing steel, which means that in hybrid bearings also the abrasive wear rate is significantly lower than with steel bearings.

Due to their inertness and extreme hardness, CEROBEAR  $\text{Si}_3\text{N}_4$  rolling elements maintain a smoother surface roughness than steel rolling bodies over their entire life. This leads to minimal wear in the cage pockets. While with steel bearings the cage is often the component which defines the maintenance cycle of the autoclave, in CEROBEAR hybrid ceramic bearings it is typically not. CEROBEAR offers cages made from brass, aluminum bronze or silver-plated steel, to achieve the maximum bearing life.



*Unique CEROBEAR Hybrid Thrust Spherical Roller Bearing*

CEROBEAR offers three different steel grades for the races of our range of autoclave bearings. Cronidur® 30, a High-Nitrogen Steel is used for motor bearings and at high VA concentration. We recommend M50 tool steel for high temperature stirrer bearings, mainly at LDPE production. Powder Metallurgical Steel (PM Steel) with a hardness of 68 HRC, is state-of-the-art raceway material, to deliver maximized performance at the most demanding operating conditions.

As a result the service life of CEROBEAR hybrid ceramic bearings is between 4 to 8 times longer than the one of conventional steel bearings. Reduced reactor downtime and maintenance costs, combined with minimized production loss, overcompensate the higher cost for the ceramic technology.